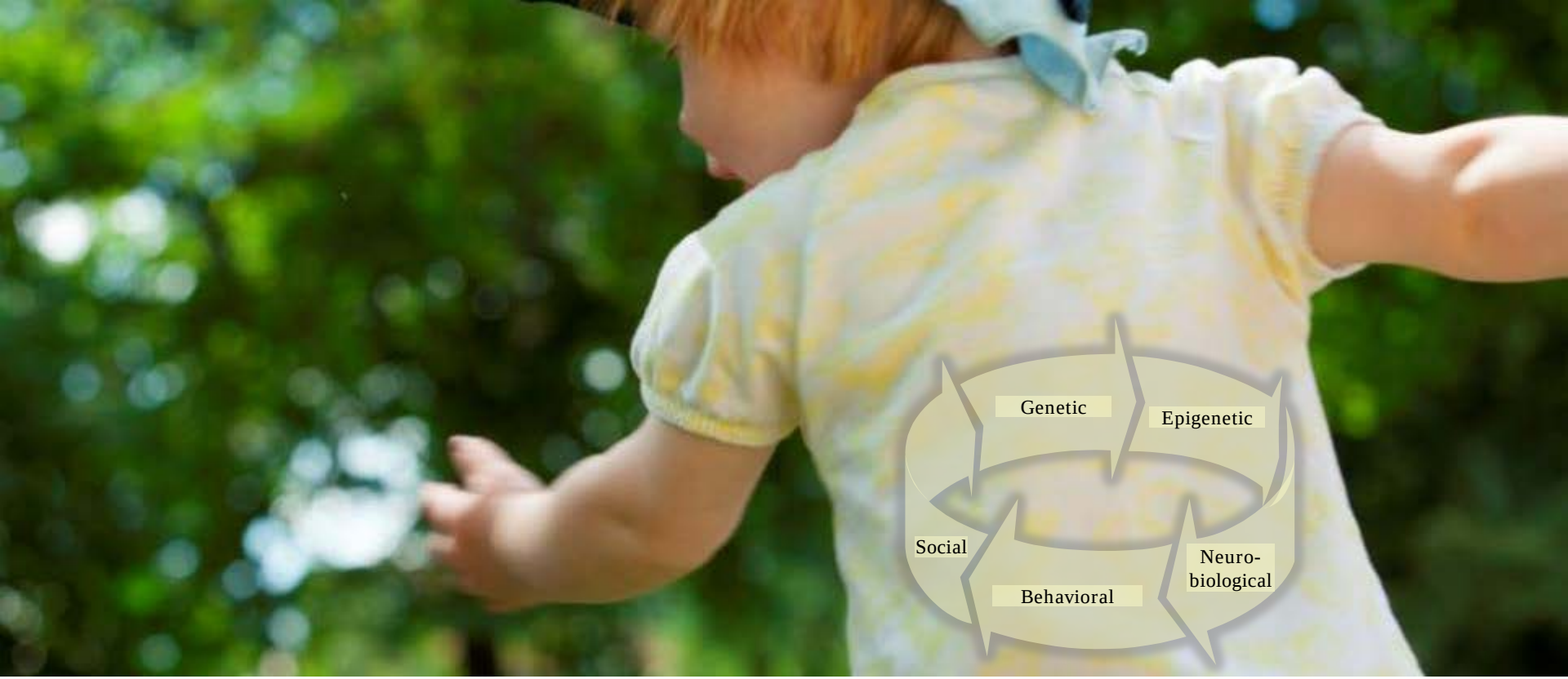


The Science of Learning

Research Funding Strategy 2016 – 2020

14 Feb 2016

JACOBS FOUNDATION

Our Promise to Youth

The "Science of Learning"

Our research agenda for the next 5 years

A We generate **insights into the individual biological bases of learning and development** of children and youth, the interactions between learning contexts and the individual, and their consequences for learning environments and institutions.

B We explore frontiers of individualized learning and interventions, and generate results that will **inform the Foundation's intervention designs** in the years ahead, in particular with regard to the use of technologies to optimize learning.

C Through the Jacobs Foundation Research Fellowship Program we **identify and support the most talented and innovative young researchers** in psychology, education, sociology, economics, developmental & cognitive neurosciences, (epi-) genetics, evolutionary biology, pediatrics, and human-computer interaction.

D We continue to **invest into the Jacobs Center for Productive Youth Development** at the University of Zurich and develop it towards a **world-class research institution**.

Understanding how children learn

Why it matters

- Every child is different. **Understanding the specific needs of individual children and tailoring education and learning to their needs** would be an historic breakthrough, promising unprecedented opportunities to tackle inequalities in opportunities between children that can last a lifetime.
- This breakthrough would ensure that most children are equipped with the **key skills and capacities for a successful life**: cognitive skills that make us good at mathematics, reading and writing, and social and emotional skills that help us think, forge relationships, and navigate difficult situations.
- Learning in late life, just like learning in childhood, depends on genetic, genomic, and neurobiological conditions of the brain. The work we support will feed into the **understanding of lifelong learning** for tomorrow's longer lifespans.
- This is a great ambition. Achieving it requires **focused research across diverse disciplines** that help us understand children's learning.
- It demands a thorough **understanding of the interaction of an individual's biology and the many contexts and settings where learning occurs** – be it the family, the playground, or the classroom.

Individual biological bases of learning and development

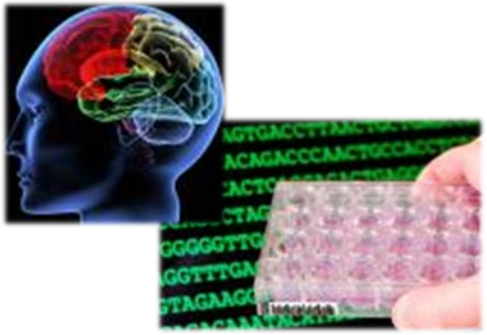
What it means

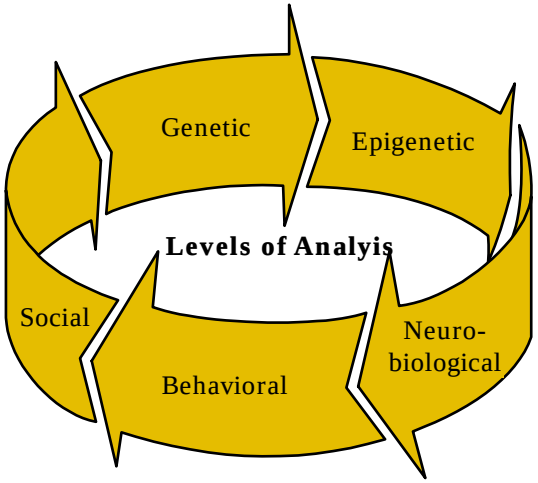
- Research during the last years has moved beyond the debate about "nature vs. nurture." Instead it has established that it is **interactions among genes and environments,** in particular during during early childhood, that guide human development.
- Subtle **genetic differences cause people to respond, develop, and behave differently** when exposed to the same environmental influence.
- We now know more – but not nearly enough! – about connections between genetics and context factors, and how those connections influence human development – and learning.
- Relevant recent questions include
  - How DNA variation predisposes organisms to be more or less affected by their experiences
  - How experiences become embedded in biology
  - How social behavior influences genetic variation and gene regulation; and how genetic differences and gene regulation reciprocally influence behavior
  - How changes in brain structures relate to genetic and environmental factors, and how brain development and behavioral development influence each other

Individual biological bases of learning and development

What we will do

- An overarching key question will guide our work in the next years: **Which individual biological characteristics are relevant for successful learning – and how can the knowledge about these characteristics be used to design better and more efficient teaching methods, learning contexts, and interventions?**
- We will not focus narrowly on the «genetics of intelligence», but apply a broader concept of **individual biological prerequisites of learning and their interaction with learning contexts.**
- We will not look at the genotype in isolation, but rather focus on **functional genomics, i.e., a wide range of mechanisms of genetic expression, and neurobiological mechanisms,** that are relevant for learning and result from the complex interaction between individuals' genetic make-up and the social and material environment that they are exposed to over the life course.
- **The conceptual and empirical combination of genetic, epigenetic, neurobiological, behavioral and social levels of analysis will be the distinguishing feature of projects and researchers funded within this thematic priority.**





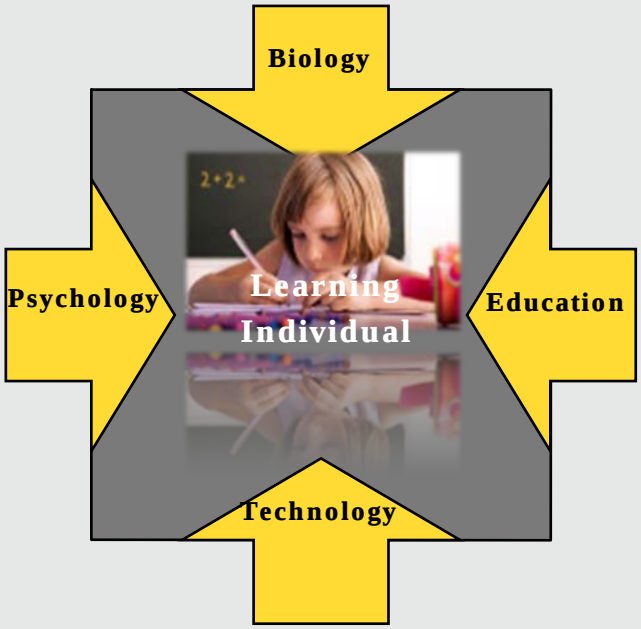
Focus on four key dimensions of learning

Frontiers of individualized learning and intervention

Learning processes and learning individuals are always **embedded in and influenced by context and social setting**, e.g., income, occupational status, education, ethnicity, migrant status, schools, neighborhoods etc.

Biological Dimension, e.g.:

- How large are individual differences that naturally occur among learners?
- How do genes and their interactions with learning contexts determine individual differences in learning and memory?
- What are domain-specific sensitive periods in learning and development during which strategic investments can shape outcomes across the lifespan?
- How can animal models help us to understand human behavioral development, and what are limitations?



Psychological Dimension, e.g.:

- What are the developmental processes that connect genetics and education, and the socio-ecological contexts against which those processes unfold?
- Which contextual factors are most conducive to enabling enduring trajectories of positive development?

Pedagogical Dimension, e.g.:

- How can kindergarten and schools make better use of insights about how individuals learn?
- How can families and institutions outside of schools or kindergartens apply this knowledge?
- How can children and youth best learn social-emotional skills?

Technological Dimension, e.g.:

- How can interactions with intelligent learning systems enhance human learning?
- How can knowledge about basic learner characteristics support adaptive, technology-supported education programs?
- How can insights from Neurobiology help improve technology-supported learning and cognitive tutoring?
- Which combination of technological innovations is needed to foster optimal learning in different individuals?

Research on the individual biological bases of learning and development

Funding instruments and strategic partnerships

A

Preliminary – Work in Progress

- The key instrument to advance knowledge in the Science of Learning will be the **Jacobs Foundation Research Fellowships**, identifying and supporting the most talented and innovative young researchers in the field.

JACOBS FOUNDATION RESEARCH FELLOWSHIPS

- A strategic option currently being explored is the creation of an international Jacobs Research Network **"Individualized Learning and Intervention"** (working title), bringing together 10-12 leading academics in the field (supported by one 3-year-postdoc position each) with the remit to identify and tackle the most important unanswered research questions in the field. The ZIF Research Group »Genetische und soziale Ursachen von Lebenschancen» could be a model, and a collaboration should be considered.

ZiF

- Discussions are ongoing with the **Child and Brain Development Program, Canadian Institute for Advanced Research (CIFAR)**, on a joint conference **"Reconciling Genes and Contexts: Exploring the Genomic & Environmental Headwaters of Early Brain Development**" to be held at Marbach Castle in spring 2018.

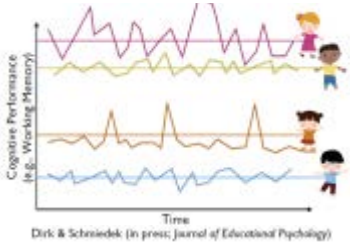
CIFAR CANADIAN INSTITUTE FOR ADVANCED RESEARCH

Use-inspired research on technology-supported, individualized assessment and learning

B

Informing the Foundation's intervention designs in the years to come

- The subsequent considerations are based on the premise that the collection of children's genetic information and their use for research and intervention design will be difficult, if not impossible, in Switzerland in the foreseeable future.
- A more feasible approach toward individualized learning is to **measure the – to a large extent biologically influenced– individual physiological and socio-emotional antecedents of learning** (e.g., temperament, mood, anxiety, sleep), their influence on learning processes, and the contexts with which they interact.
- This approach involves looking at **inter-individual differences** (i.e. differences between different persons) and at **intra-individual differences** (i.e. differences within a person at different time points/in different contexts).
- In such interventions, **digital and mobile technology** is not only used to deliver individualized and adaptive learning content, but also to assess and empirically measure in a non-invasive way the individual antecedents of learning and the contexts in which they unfold.
- Combined, these different levels of analysis will allow for **targeted, differentiated learning support** through and/or facilitated by technology.



Use-inspired research on technology-supported, individualized assessment and learning

B

Strategic Partnerships

Preliminary – Work in Progress

- A strategic partnership is currently being explored with the German Institute for International Educational Research (DIPF).
- A key element of the suggested partnership will be a cross-disciplinary research program investigating **individual physiological and socio-emotional antecedents of cognitive performance and affective wellbeing**.
- Building on this program, **interventions** will be developed that are tailored to the individual patterns of relevant antecedents and that help improve individual cognitive resources and affective wellbeing.
- **Mobile technology** will be employed to assess affects, cognitive resources, physical activity, and experiences through experience sampling.
- The same technology will also be used to deliver the interventions aiming to improve the individual cognitive resources and affective wellbeing.

DIPF

Our Flagship Program

Identifying and supporting the most talented and innovative researchers in child and youth development

JACOBS FOUNDATION RESEARCH FELLOWSHIPS

	Jacobs Early Career Research Fellowship	Jacobs Advanced Research Fellowship
Target Group	Highly talented young scholars working on child and youth development. **The ideal candidate has obtained his/her PhD no more than 7 years ago.**	Most innovative mid-career researchers working on child and youth development. **The ideal candidate has obtained his/her PhD no more than 15 years ago.**
Funding amount	150,000 CHF	400,000 CHF
Funding period	3 years	3 years
Number of fellowships per year	7–11	2–3
Funds may be used to cover own salary	Yes, up to 50 %	Yes, up to 25 %
Overhead / indirect costs	Up to 10 % of total amount	Up to 10 % of total amount

Jacobs Center for Productive Youth Development

A world-class research center on child and youth development

- The mission of the Jacobs Center for Productive Youth Development at the University of Zurich is to **understand how social, psychological, biological, and economic factors interact** in creating opportunities and overcoming obstacles in child and youth development.
- The Center was created in 2002 as a joint effort of the Jacobs Foundation and the University of Zurich.
- In 2015 the founding partners agreed on **a significant expansion** of the center.
- During the next 20 years, **the Foundation and the University will invest 35 Mio. CHF each** to develop three competence areas covering a broad range of economic, bio-psychological, and sociological aspects in child and youth development
- The Founding directors of the “new” Jacobs Center are Professor N.N. and Professor N.N.

Universität Zürich[UZH]

Jacobs Center for Productive Youth Development

Building on our Success

Three established funding instruments and programs are the backbones of our work

E We support young researchers in child and youth development & create research capacities together with leading international partners

F We create attention and recognition for research on child and youth development

G We provide time and space for scientific exchange on the highest level

SCHLOSS MARBACH

Young Scholar Support

Creating research capacities together with leading international partners

Ongoing Partnerships

Leibniz Association:
Postdoctoral College for Interdisciplinary Educational Research (CIDER)

International Max Planck Research School LIFE:
LIFE Fellowships at the University of Zurich

International Society for the Study of Behavioral Development:
Global Mentored Doctoral Fellowship Program

University of Bern:
Swiss Graduate School for Learning and Memory

Society for Research in Child Development:
Travel Grants for International Young Scholars to Biennial Meetings

Partnerships currently being explored

International Society for the Learning Sciences

European Association for Research on Learning and Instruction

International Congress on Infant Studies

Flux: The International Society for Integrative Developmental Cognitive Neuroscience

Klaus J. Jacobs Research Prize

Creating attention and recognition for research on child and youth development

- The **Klaus J. Jacobs Research Prize**, endowed with 1 Million Swiss Francs, awards outstanding scientific contributions of individuals from all disciplines aiming at improving the development and living conditions of children and youth.

- Laureates to date:
  - **2009: Laurence Steinberg** (psychopathology, risk-taking and decision-making behavior of young people),
  - **2010: Terrie Moffitt and Avshalom Caspi** (interplay between genetic disposition and environmental influences in the development of children and youth),
  - **2011: Michael Tomasello** (identification of uniquely human forms of collaboration, communication and cultural learning),
  - **2012: Dante Cicchetti** (developmental consequences of child maltreatment and resilience as a dynamic developmental process),
  - **2013: Greg Duncan** (long-term consequences of childhood poverty for life chances in adulthood),
  - **2014: Michael Meaney** (mechanisms for how parental care becomes embedded in children's biology),
  - **2015: Sarah-Jayne Blakemore** (understanding emotional and social brain development during adolescence).

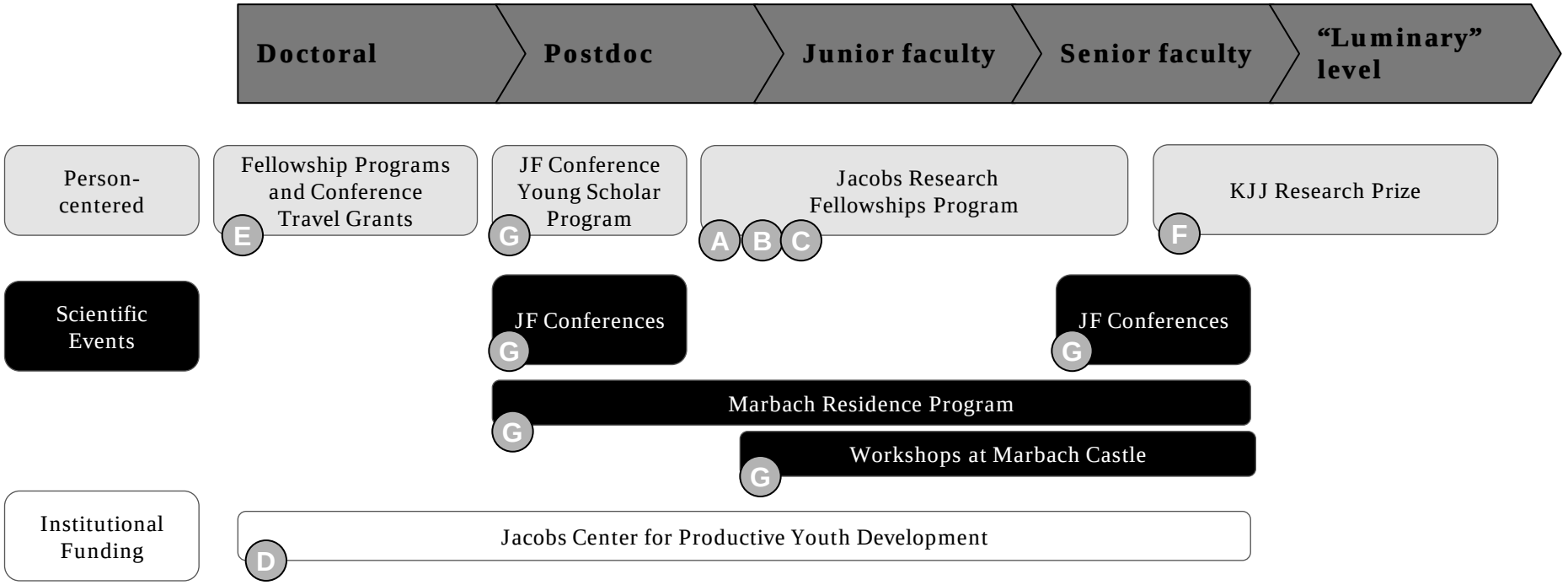
Marbach Castle

Time and space for scientific exchange on the highest level

- The Castle, overlooking Lake Constance, was built in the 13th century and has been owned by the Foundation since 1990
- The **Jacobs Foundation Conference**, held at Marbach Castle since 1991, has gained recognition throughout the world as a forum for discussing key issues of child and youth development. It is synonymous with scientific exchange at the highest level and dynamic interdisciplinarity, bringing together leading international scientists and junior researchers (through the **JF Conferences Young Scholar Program**)
- Since 2012 the Jacobs Foundation has convened "**Workshops and Symposia at Marbach Castle**" (available solely to project partners of the Jacobs Foundation)
- Since 2015: the **Marbach Residence Program** offers small groups of senior and/or junior (post-doctoral) researchers in the field of child and youth development an inspiring setting for conducting uninterrupted, goal-oriented, collaborative work (early September each year)

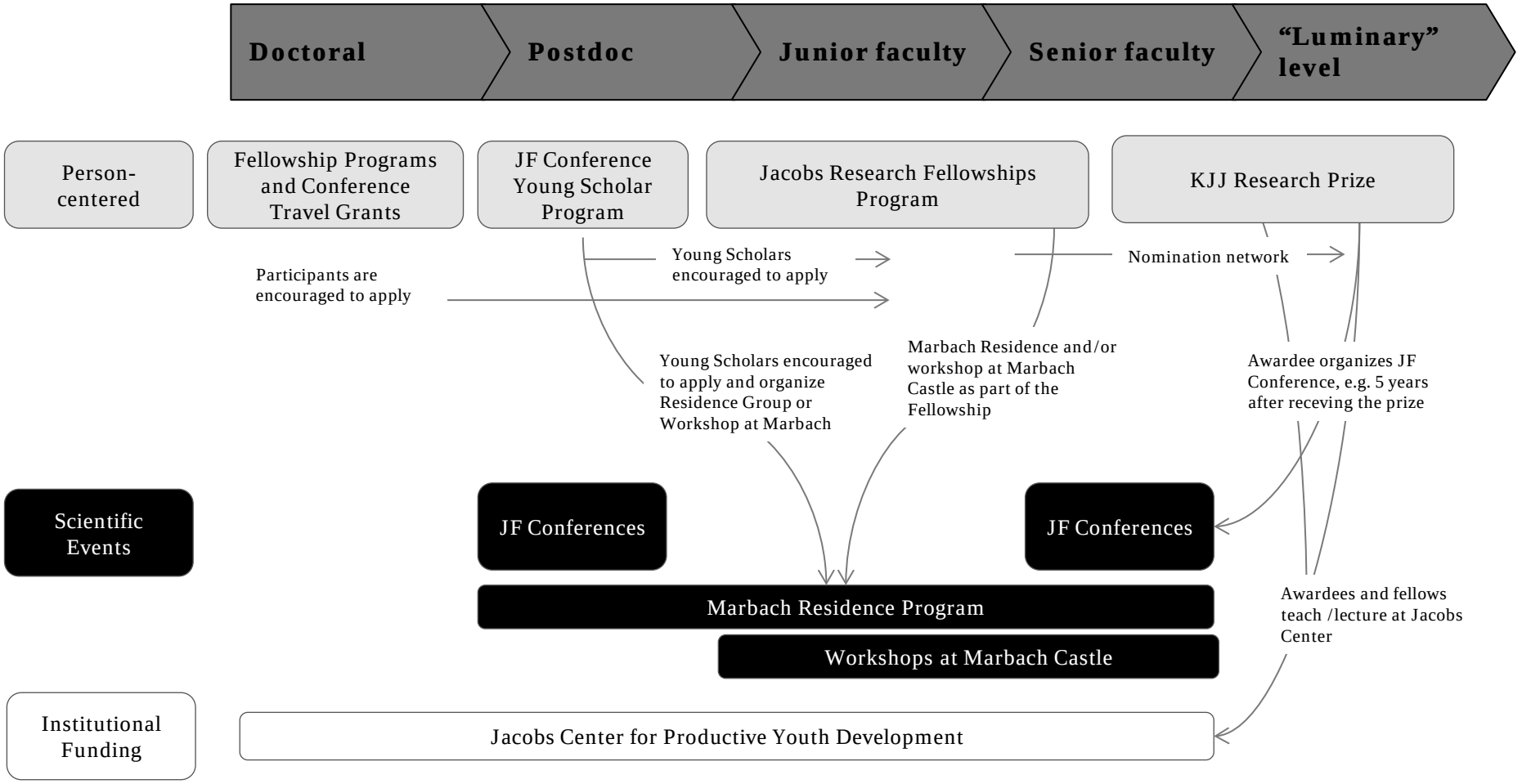
Overview

Focus on person-centered approaches along the biography of a researcher



Overview

A strong interconnection is the key feature of the research funding portfolio



Thank you very much!

PS: Twin studies are the best way to understand how genotype affects phenotype…